

TEACHER EDITION

features

You have a lot of great material at your fingertips in this resource! *Physics* Teacher Edition 4th Edition features reduced student pages with side and bottom margins packed with educational content. Take a look at what it offers, whether you are a classroom teacher or a home educator.

Lesson Plan Overviews

A Lesson Plan Overview, providing a one-stop planning center, immediately precedes each chapter. The detail in the overviews has been greatly enhanced for 4th Edition, integrating the accompanying Student Edition, Lab Manual, Teacher Lab Manual, and online resources to give you an idea of how much time each chapter will take. Each overview includes the objectives, printed resources, digital resources, and assessments for each section. The schedule for each chapter includes a review day and a test day.

LESSON PLAN OVERVIEW

Chapter 13: Thermodynamic Laws (*Foundational*)

PAGES	OBJECTIVES	PRINTED RESOURCES & MATERIALS	DIGITAL RESOURCES	ASSESSMENTS
SECTION 13.1 THE ZEROth AND FIRST LAWS				
339–48	<p>13.1.1 State the zeroth, first, and conservation laws of thermodynamics.</p> <p>13.1.2 Apply the zeroth, first, and conservation laws of thermodynamics to real-world thermodynamic systems.</p> <p>13.1.3 Describe how a heat engine functions.</p> <p>13.1.4 Analyze thermodynamic systems with <i>PV</i> diagrams.</p> <p>13.1.5 Describe thermodynamic systems and processes.</p>	<p>Teacher Edition</p> <ul style="list-style-type: none"> Section 13.1 Review <p>Assessments</p> <ul style="list-style-type: none"> Section 13.1 Quiz <p>Materials</p> <ul style="list-style-type: none"> small aquarium Erlenmeyer flasks, 250 mL (2) rubber stoppers (2) food coloring, red and blue 	<p>Teacher Tools Online</p> <ul style="list-style-type: none"> PPT Presentation: Section 13.1 Slides 	<p>Section 13.1 Review</p> <p>Section 13.1 Quiz</p>
SECTION 13.2 THE SECOND AND THIRD LAWS				
349–54	<p>13.2.1 State the second and third laws of thermodynamics.</p> <p>13.2.2 Apply the second and third laws of thermodynamics to real-world thermodynamic systems.</p> <p>13.2.3 Compare real heat engines with ideal heat engines.</p> <p>13.2.4 Describe how refrigeration works.</p> <p>13.2.5 Analyze the effects of air conditioning on American culture.</p> <p>NEW Ethics (explain)</p>	<p>Teacher Edition</p> <ul style="list-style-type: none"> Case Study: Giving Yellow Fever the Cold Shoulder (p. 355) Mini Lab: Cooling Air (p. 356) Section 13.2 Review <p>Assessments</p> <ul style="list-style-type: none"> Section 13.2 Quiz 	<p>Teacher Tools Online</p> <ul style="list-style-type: none"> PPT Presentation: Section 13.2 Slides Web Links: Carnot Cycle, Heat Engine, Heat Pump 	<p>Section 13.2 Review</p> <p>Section 13.2 Quiz</p>
SECTION 13.3 ENTROPY AND ITS CONSEQUENCES				
357–62	<p>13.3.1 Describe entropy conceptually and mathematically.</p> <p>13.3.2 Explain how entropy changes for natural irreversible processes.</p> <p>13.3.3 Evaluate scientific theories as they relate to entropy.</p> <p>NEW Foundations (evaluate)</p> <p>13.3.4 Formulate a position regarding our society's obligation to make new technologies available to all.</p> <p>NEW Ethics (formulate)</p>	<p>Teacher Edition</p> <ul style="list-style-type: none"> Section 13.3 Review Ethics: Technology Help for All (p. 363) <p>Assessments</p> <ul style="list-style-type: none"> Section 13.3 Quiz 	<p>Teacher Tools Online</p> <ul style="list-style-type: none"> PPT Presentation: Section 13.3 Slides Web Link: Entropy 	<p>Section 13.3 Review</p> <p>Section 13.3 Quiz</p>

LESSON PLAN OVERVIEW

Chapter I: Foundations of Physics (*Foundational*)

PAGES	OBJECTIVES	PRINTED RESOURCES & MATERIALS	DIGITAL RESOURCES	ASSESSMENTS
SECTION 1.1 SOLVING PROBLEMS WITH PHYSICS				
3–9	<p>1.1.1 Justify the study of physics from the perspective of a biblical worldview. BWS Foundations (explain)</p> <p>1.1.2 Analyze the challenges of doing physics. BWS Ethics (explain)</p>	<p>Teacher Edition</p> <ul style="list-style-type: none"> Careers: <i>Serving as a Systems Engineer</i> Case Study: <i>GPS and Scientific Inquiry</i> Section 1.1 Review <p>Assessments</p> <ul style="list-style-type: none"> Section 1.1 Quiz 	<p>Teacher Tools Online</p> <ul style="list-style-type: none"> PPT Presentation: <i>Section 1.1 Slides</i> 	<p>Formative Assessment: <i>Types of Models</i></p> <p>Section 1.1 Review</p> <p>Section 1.1 Quiz</p>
SECTION 1.2 DIMENSIONS OF PHYSICS				
10–15	<p>1.2.1 Justify the use of the SI.</p> <p>1.2.2 Explain how fundamental dimensions help define the universe.</p> <p>1.2.3 Identify dimensions used in physics.</p> <p>1.2.4 Indicate the characteristics of an SI unit.</p> <p>1.2.5 Relate SI units to their corresponding fundamental dimensions.</p> <p>1.2.6 Convert between SI units.</p>	<p>Teacher Edition</p> <ul style="list-style-type: none"> Section 1.2 Review <p>Assessments</p> <ul style="list-style-type: none"> Section 1.2 Quiz <p>Material</p> <ul style="list-style-type: none"> object (wood block, ball, or roll of tape) food items (3) with both SI and US customary units (at least one item with mass/weight and one with volume) 	<p>Teacher Tools Online</p> <ul style="list-style-type: none"> PPT Presentation: <i>Section 1.2 Slides</i> Web Links: <i>SI, Which Cubit?</i> 	<p>Formative Assessment: <i>The Système International (SI)</i></p> <p>Section 1.2 Review</p> <p>Section 1.2 Quiz</p>
SECTION 1.3 PRINCIPLES OF MEASUREMENT				
16–20	<p>1.3.1 Explain the purpose and limitations of scientific instruments. BWS Foundations (explain)</p> <p>1.3.2 Compare accuracy and precision. BWS Modeling (evaluate)</p> <p>1.3.3 Determine the precision of data collected with a given instrument.</p> <p>1.3.4 Analyze a graphical model for the determination of the speed of light.</p>	<p>Teacher Edition</p> <ul style="list-style-type: none"> Case Study: <i>Measurement and Uncertainty</i> Section 1.3 Review <p>Assessments</p> <ul style="list-style-type: none"> Section 1.3 Quiz <p>Material</p> <ul style="list-style-type: none"> metric rulers (one for each student) 	<p>Teacher Tools Online</p> <ul style="list-style-type: none"> PPT Presentation: <i>Section 1.3 Slides</i> 	<p>Section 1.3 Review</p> <p>Section 1.3 Quiz</p>

PAGES	OBJECTIVES	PRINTED RESOURCES & MATERIALS	DIGITAL RESOURCES	ASSESSMENTS
SECTION 1.4 INTEGRITY IN DATA				
21–28	<p>1.4.1 Explain the purpose of significant figures.</p> <p>1.4.2 Express measurements and calculated answers with the correct number of significant figures.</p>	<p>Teacher Edition</p> <ul style="list-style-type: none"> • Mini Lab: <i>Just Eyeball It!</i> (p. 28) • Section 1.4 Review <p>Assessments</p> <ul style="list-style-type: none"> • Section 1.4 Quiz <p>Material</p> <ul style="list-style-type: none"> • four-sided meter stick (one for every three students) 	<p>Teacher Tools Online</p> <ul style="list-style-type: none"> • PPT Presentation: <i>Section 1.4 Slides</i> 	<p>Section 1.4 Review</p> <p>Section 1.4 Quiz</p>
LAB 1A LONG SHOT—CREATING HISTOGRAMS				
LM 1–8	<p>Organize collected data in a table.</p> <p>Calculate mean and standard deviation.</p> <p>Analyze data using a spreadsheet program.</p> <p>Display data on histograms.</p>		<p>Teacher Tools Online</p> <ul style="list-style-type: none"> • Instructional Aid: <i>Lab 1A Data</i> 	Lab Report
LAB 1B ZEROING IN—INQUIRING INTO EXPERIMENTAL DESIGN				
LM 9–10	<p>Modify an experiment to improve the consistency of the data.</p> <p>Evaluate your modified experimental procedures using statistical methods.</p>	<p>Teacher Lab Manual</p> <ul style="list-style-type: none"> • Lab 1B Teacher Guide 		Lab Report
CHAPTER 1 REVIEW				
29–31	<p>Apply the inquiry process and mindset to real-world problems.</p> <p>Convert measurements between SI units.</p> <p>Report data with appropriate accuracy and precision.</p> <p>Compare measured data with other values.</p> <p>Evaluate empirical data and methods using statistics. (Lab 1A)</p> <p>Evaluate an experimental procedure to improve accuracy of collected data. (Lab 1B)</p>	<p>Teacher Edition</p> <ul style="list-style-type: none"> • Chapter Review Solutions 		Chapter Review
CHAPTER 1 TEST				
	Demonstrate knowledge of concepts from Chapter 1 by taking the test.	<p>Assessments</p> <ul style="list-style-type: none"> • Chapter 1 Test 	<p>Teacher Tools Online</p> <ul style="list-style-type: none"> • EV: <i>Chapter 1 Bank</i> 	Chapter 1 Test

LESSON PLAN OVERVIEW

Chapter 2: Motion in One Dimension (*Foundational*)

PAGES	OBJECTIVES	PRINTED RESOURCES & MATERIALS	DIGITAL RESOURCES	ASSESSMENTS
SECTION 2.1 DESCRIBING MOTION (2 DAYS)				
33–43	<p>2.1.1 Define <i>motion</i>.</p> <p>2.1.2 Explain how physics describes motion.</p> <p>2.1.3 Create scientific diagrams.</p> <p>2.1.4 Analyze motion (position-time and velocity-time graphs).</p>	<p>Teacher Edition</p> <ul style="list-style-type: none"> Section 2.1 Review <p>Assessment</p> <ul style="list-style-type: none"> Section 2.1 Quiz <p>Materials</p> <ul style="list-style-type: none"> tape for number lines straightedge 	<p>Teacher Tools Online</p> <ul style="list-style-type: none"> PPT Presentation: <i>Section 2.1 Slides</i> 	<p>Formative Assessment: <i>Checking Distance and Displacement</i></p> <p>Section 2.1 Review</p> <p>Section 2.1 Quiz</p>
LAB 2A KEEPING THINGS ROLLING—CURVE FITTING USING VIDEO ANALYSIS				
LM 11–18	<p>Collect data using video capture.</p> <p>Explain the relationship between position, velocity, and acceleration.</p> <p>Analyze motion using curve fitting.</p>		<p>Teacher Tools Online</p> <ul style="list-style-type: none"> Web Link: <i>Lab 2A Web Links</i> Instructional Aids: <i>Lab 2A Videos, Lab 2A Data</i> 	Lab Report
SECTION 2.2 THE EQUATIONS OF MOTION				
44–54	<p>2.2.1 Solve motion problems algebraically and graphically.</p> <p>2.2.2 Solve free fall problems.</p> <p>2.2.3 Analyze data on vehicle speed and braking distance. BWS Modeling (explain)</p> <p>2.2.4 Formulate a position on car seat safety laws. BWS Ethics (formulate)</p>	<p>Teacher Edition</p> <ul style="list-style-type: none"> Worldview Investigation: <i>Crash Course</i> <i>Crash Course</i> Rubric Case Study: <i>Using Kinematics to Model Stopping Distance</i> Mini Lab: <i>Tossup</i> Section 2.2 Review Ethics: <i>Car Seat Regulations</i> (pp. 58–59) <p>Assessment</p> <ul style="list-style-type: none"> Section 2.2 Quiz 	<p>Teacher Tools Online</p> <ul style="list-style-type: none"> PPT Presentation: <i>Section 2.2 Slides</i> Instructional Aid: <i>Crash Course Rubric</i> Web Link: <i>Free Fall Video</i> 	<p>Section 2.2 Review</p> <p>Section 2.2 Quiz</p> <p><i>Crash Course</i> Debate Arguments</p>
LAB 2B TIME TO FALL—MEASURING ACCELERATION DUE TO GRAVITY				
LM 19–24	<p>Collect time interval data using both manual and automated methods.</p> <p>Compare the accuracy of manual and automated time measurement methods.</p> <p>Calculate the acceleration due to gravity.</p>			Lab Report

PAGES	OBJECTIVES	PRINTED RESOURCES & MATERIALS	DIGITAL RESOURCES	ASSESSMENTS
ETHICS DAY: CAR SEAT REGULATIONS				
58–59	2.2.4 Formulate a position on car seat safety laws. BWS Ethics (formulate)	Teacher Edition • Ethics: Car Seat Regulations		
LAB 2C EVERYDAY ACCELERATIONS—MEASURING EVERYDAY ACCELERATIONS				
LM 25–28	Collect acceleration data for everyday motion using a smartphone app. Determine the directions of positive acceleration of a smartphone. Predict values for accelerations for everyday motion. Evaluate predictions on the basis of empirical data.			Lab Report
CHAPTER 2 REVIEW				
55–59	Analyze graphical models of motion. Solve motion problems using models of motion. Create a graphical model of braking distance. Analyze motion data collected in the laboratory. (Lab 2A) Evaluate different methods for collecting data. (Lab 2B) Analyze data for everyday motion. (Lab 2C)	Teacher Edition • Chapter Review Solutions		Chapter Review
CHAPTER 2 TEST				
	Demonstrate knowledge of concepts from Chapter 2 by taking the test.	Assessments • Chapter 2 Test	Teacher Tools Online • EV: Chapter 2 Bank	Chapter 2 Test

LESSON PLAN OVERVIEW

Chapter 3: Vectors and Scalars (*Foundational*)

PAGES	OBJECTIVES	PRINTED RESOURCES & MATERIALS	DIGITAL RESOURCES	ASSESSMENTS
SECTION 3.1 VECTOR AND SCALAR PROPERTIES				
61–65	<p>3.1.1 Identify vector and scalar quantities.</p> <p>3.1.2 Compare angles measured on a graph with those on a map.</p> <p>3.1.3 Explain how to transport vectors.</p>	<p>Teacher Edition</p> <ul style="list-style-type: none"> Case Study: <i>Mapping Currents</i> Section 3.1 Review <p>Assessments</p> <ul style="list-style-type: none"> Section 3.1 Quiz <p>Materials</p> <ul style="list-style-type: none"> a large arrow made of foamboard or wood 	<p>Teacher Tools Online</p> <ul style="list-style-type: none"> PPT Presentation: <i>Section 3.1 Slides</i> Web Links: <i>Vector Basics, Current Map, Current Vectors</i> 	<p>Section 3.1 Review</p> <p>Section 3.1 Quiz</p>
SECTION 3.2 GRAPHICAL VECTOR OPERATIONS				
66–69	<p>3.2.1 Summarize the process of adding vectors graphically.</p> <p>3.2.2 Solve vector addition problems by scalar multiplication.</p> <p>3.2.3 Solve vector addition problems graphically.</p>	<p>Teacher Edition</p> <ul style="list-style-type: none"> Section 3.2 Review <p>Assessments</p> <ul style="list-style-type: none"> Section 3.2 Quiz <p>Materials</p> <ul style="list-style-type: none"> two arrows: a large arrow (labeled 5 km) and a smaller arrow (labeled 2 km), both made of foamboard or wood protractors and metric rulers (one for each student) 	<p>Teacher Tools Online</p> <ul style="list-style-type: none"> PPT Presentation: <i>Section 3.2 Slides</i> Videos: <i>Vector Addition, Commutative Property with Vector Addition</i> 	<p>Section 3.2 Review</p> <p>Section 3.2 Quiz</p>
ETHICS DAY				
85	<p>3.3.5 Develop a position regarding when to evacuate for a hurricane.</p> <p>BWS Ethics (apply)</p>	<p>Teacher Edition</p> <ul style="list-style-type: none"> Ethics: <i>Should I Stay or Should I Go?</i> Ethics Essay Rubric (Appendix J) 	<p>Teacher Tools Online</p> <ul style="list-style-type: none"> Instructional Aid: <i>Ethics Essay Rubric</i> 	Ethics Essay
LAB 3A PARTS OF THE WHOLE—INVESTIGATING VECTOR COMPONENTS				
LM 29–34	<p>Measure the components of a vector.</p> <p>Create a vector from its components.</p> <p>Relate trigonometric functions to the vector components that you worked with in the laboratory.</p>			Lab Report

PAGES	OBJECTIVES	PRINTED RESOURCES & MATERIALS	DIGITAL RESOURCES	ASSESSMENTS
SECTION 3.3 ALGEBRAIC VECTOR OPERATIONS (3 DAYS)				
70–81	<p>3.3.1 Solve right triangles by using trigonometric functions.</p> <p>3.3.2 Resolve vectors into components.</p> <p>3.3.3 Summarize the process of adding vectors algebraically.</p> <p>3.3.4 Solve vector addition problems algebraically.</p> <p>3.3.5 Develop a position regarding when to evacuate for a hurricane.</p> <p>BWS Ethics (apply)</p>	<p>Teacher Edition</p> <ul style="list-style-type: none"> • Mini Lab: <i>Using Vectors to Predict Hurricane Movement</i> (p. 82) • Section 3.3 Review • Ethics: <i>Should I Stay or Should I Go?</i> (p. 85) <p>Assessments</p> <ul style="list-style-type: none"> • Section 3.3 Quiz <p>Materials</p> <ul style="list-style-type: none"> • pairs of similar triangles (Make enough so that each pair of students can have a triangle.) • meter sticks (one for each pair of students) • overhead projector or other strong light source (Using two light sources makes the demonstration more effective.) 	<p>Teacher Tools Online</p> <ul style="list-style-type: none"> • PPT Presentation: <i>Section 3.3 Slides</i> • Videos: <i>Vector Components, Vector Addition</i> 	<p>Section 3.3 Review</p> <p>Section 3.3 Quiz</p>
LAB 3B THE ROUNDABOUT WAY—ADDING VECTORS				
LM 35–39	<p>Determine the vectors needed to represent the path between two positions.</p> <p>Determine the displacement between two positions both graphically and algebraically.</p>			Lab Report
CHAPTER 3 REVIEW				
83–85	<p>Explain how vectors are a problem-solving tool of physics.</p> <p>Compare vectors and scalars.</p> <p>Perform vector operations to find a resultant vector.</p> <p>Determine how to use vectors to model forces in the real world. (Lab 3A)</p> <p>Measure the displacement between two positions using indirect means. (Lab 3B)</p>	<p>Teacher Edition</p> <ul style="list-style-type: none"> • Chapter Review Solutions 		Chapter Review
CHAPTER 3 TEST				
	Demonstrate knowledge of concepts from Chapter 3 by taking the test.	<p>Assessments</p> <ul style="list-style-type: none"> • Chapter 3 Test 	<p>Teacher Tools Online</p> <ul style="list-style-type: none"> • EV: <i>Chapter 3 Bank</i> 	Chapter 3 Test